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PRELIMINARY DRAFT

RICHMOND PARKWAY LOCATION REPORT

Prepared for

DEPARTMENT OF HIGHWAYS
CITY OF NEW YORK

By

LOCKWOOD, KESSLER & BARTLETT, INC.
Consulting Engineers
Syosset, New York

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LOCKWOOD, KESSLER & BARTLETT, INC.

CONSULTING ENGINEERS

ONE AERIAL WAY, SYOSSET, NEW YORK

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SAN JUAN, PUERTO RICO

July 15, 1966

Mr. Harry J. Donnelly, Commissioner
City of New York
Department of Highways
40 Worth Street
New York, New York 10013

Dear Sir:

Subject: Preliminary Draft Richmond Parkway Location Report

We submit herewith for your review and comment the preliminary draft of the Richmond Parkway Location Report.

In accordance with our agreement of June 15, 1966, the purpose of this report is "to provide an analysis for determination of the most feasible location for Proposed Richmond Parkway between the Staten Island Expressway and the vicinity of Arthur Kill Road."

Accompanying the report is the following supporting material:

Plans and Profiles of Alternates 3, 4 and 5

Plan of Alternate 2

1" = 200' scale Topographic Maps of the Study Area

Right-of-way Acquisition Tables for Alternates 3, 4 and 5

Traffic Flow Diagrams for Alternates 3, 4 and 5.

In the interests of completing the Location Report by the scheduled date of August 19, 1966, we would appreciate a review of this preliminary draft as soon as possible.

Very truly yours,

LOCKWOOD, KESSLER & BARTLETT, INC.

Robert O'Connell

Robert O'Connell
Second Vice President

ROC:mf

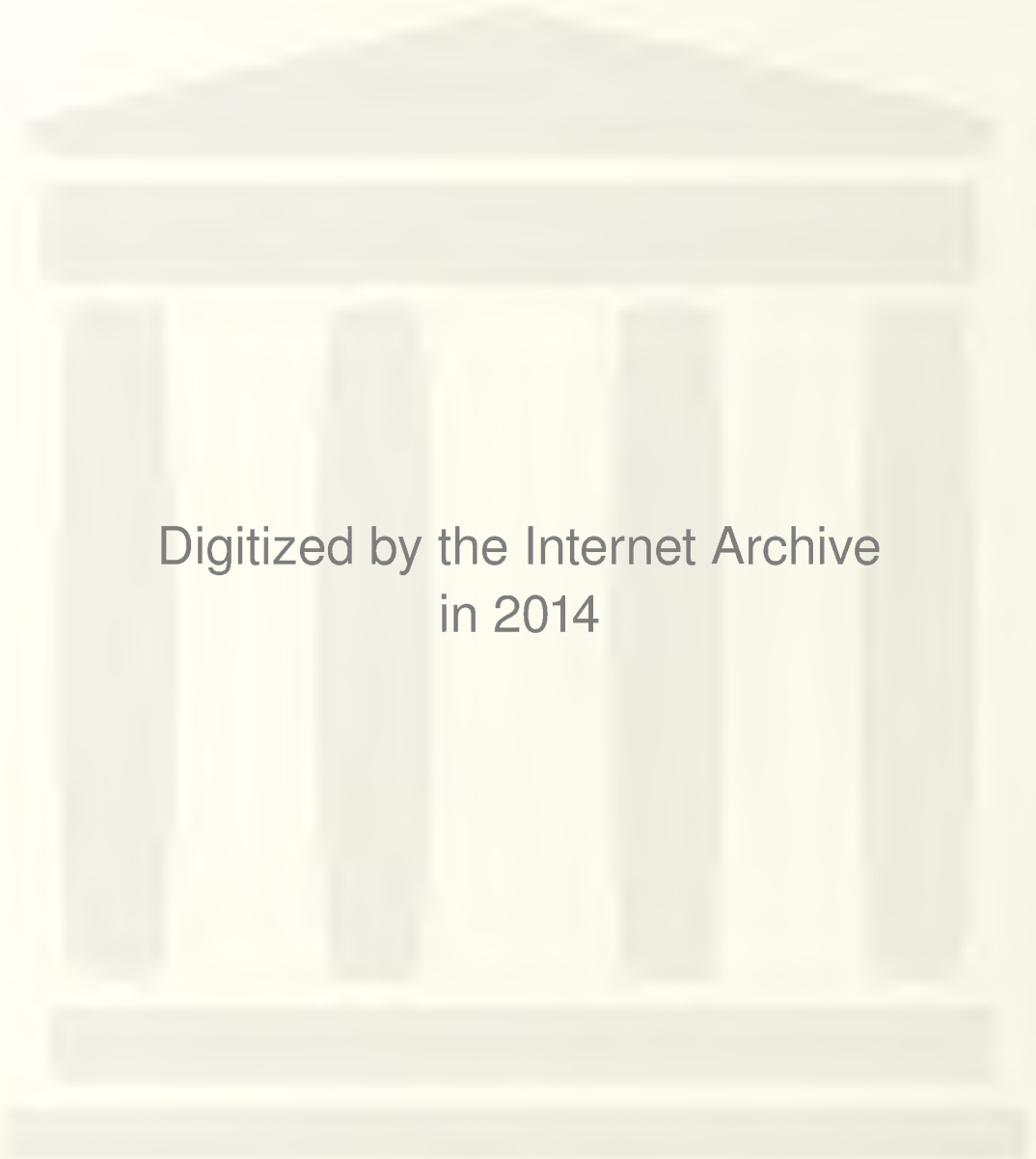

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TABLE OF CONTENTS

INTRODUCTION

Purpose of Report

BACKGROUND

Staten Island Greenbelt
Growth of Staten Island
Staten Island Arterial Highway System

CONSIDERATIONS IN ALTERNATE ROUTE SELECTION

General
Present Land Use in the Study Area
Future Land Use in the Study Area
Traffic in the Study Area
Topography and Physical Features in the Study Area
Geology and Subsurface Conditions of the Study Area
General Economic and Social Considerations
Other General Considerations in Alternate Route Selection

ALTERNATE ROUTES OF THE PRELIMINARY REPORT

Concepts of the Preliminary Report
Elimination of Alternates 1 and 2

DESIGN CRITERIA

DESCRIPTION OF ALTERNATE 3

General
Land Use
Traffic
Topography and Physical Features
Geology and Subsurface Conditions
Social and Economic Considerations
Other Considerations

TABLE OF CONTENTS (Continued)

DESCRIPTION OF ALTERNATE 4

- General
- Land Use
- Traffic
- Topography and Physical Features
- Geology and Subsurface Conditions
- Social and Economic Considerations
- Other Considerations

DESCRIPTION OF ALTERNATE 5

- General
- Land Use
- Traffic
- Topography and Physical Features
- Geology and Subsurface Conditions
- Social and Economic Considerations

SUMMARY FOR COMPARISON PURPOSES

- Purpose
- Advantages and Disadvantages
- Tabulation of Costs and Acquisitions

CONCLUDING COMMENTS

LIST OF EXHIBITS

Map of Staten Island

Map of Study Area Showing Greenbelt

Oblique Photograph of the Greenbelt

Graph Showing Growth of Staten Island Population

Map of Present Land Use in the Study Area

Map of Future Land Use in the Study Area

Aerial Mosaic of Study Area

Map of Study Area with Alternate Routes Shown

Typical Section of Initial Parkway Construction

Typical Section of Ultimate Parkway Construction

Rendering of Typical Bridge

Traffic Flow Diagram of Alternate 3

Traffic Flow Diagram of Alternates 4 and 5

Oblique Photographs of Study Area Showing Alignments

14 - 1" = 600' Plan and Profile Sheets

Reduction of Right-of-Way Acquisition Tables

PRELIMINARY DRAFT

RICHMOND PARKWAY LOCATION REPORT

INTRODUCTION

Purpose of Report

The proposed Richmond Parkway will be a vital link in the Staten Island Arterial Highway network. It is to be a 9-mile limited access facility serving the local traffic needs of the central sector of Staten Island and expediting the vehicular flow between the Outerbridge Crossing and the Verrazano-Narrows Bridge.

The southerly 4.3 miles of the parkway between Bloomingdale Road and Richmond Avenue will follow the present route of Drumgoole Boulevard. The remaining portion of the parkway, commonly known as Section 1, will extend 4.6 miles from Richmond Avenue to the Staten Island Expressway. Section 1, as presently planned, crosses the marshland adjacent to Richmond Creek, and then follows the Island's central ridge northward through Latourette Park to Todt Hill and the Staten Island Expressway.

The routing of Section 1, established some 25 years ago, cuts through the prime forestland along the ridge of the Staten Island "Greenbelt." As the lands adjacent to this wooded ridge become increasingly urbanized, the preservation of the natural environment of this area has assumed paramount importance.

The City of New York has therefore undertaken a re-evaluation of the routing of Section 1. The study conducted for this report has investigated the feasibility

of alternate routes to the proposed Richmond Parkway which will have a minimum of adverse effect upon the ridge of the Staten Island "Greenbelt." The purpose of this report is to present the basic engineering information required for selection of an alternate route to Section 1 of the Richmond Parkway should such an alternate be deemed in the best interests of the City.

BACKGROUND

Staten Island Greenbelt

The Staten Island "Greenbelt" consists of a chain of woodlands and open spaces which extends from Latourette Park in the south through the central highlands to Silver Lake Park in the north. The portion of the "Greenbelt" within the area of this study is shown in Figure . It is comprised of parklands, private camps, a country club, a cemetery and low density residential areas.

By far the most richly endowed part of the "Greenbelt" is the ridge traversed by the proposed Richmond Parkway. On Todt Hill it attains the highest tidewater elevation on the Atlantic Seaboard south of Maine. It is dominated by a magnificent growth of oaks, beech, sweetgum and sassafras. Specimen trees, wildlife and birds abound throughout the woodlands of this area.

This prime land consists of nearly 600 acres, and is over 2/3 the size of Central Park. The preservation of the wild character of this area will ensure an invaluable asset to the people of Staten Island as the Island prepares for the most dynamic growth period in its history.

It has highways through it & it is not destroyed

Growth of Staten Island

The opening of the Verrazano-Narrows Bridge has acted as a catalyst to the development of the entire Island. Although Richmond is the third largest borough in area in the City of New York, its population growth had been limited by isolation from the other parts of the City.

Staten Island is related more closely geographically to New Jersey than New York and prior to the completion of the Narrows Bridge was linked to the rest of New York City only by ferry. The northeast section around St. George and the ferries was highly developed, while the western half of the Island consisted of vacant marginal lands which offered little promise for development. The remainder of the Island was primarily rural in nature with some scattered residential development.

However, with the opening of the Narrows Bridge, the character of Staten Island has been steadily undergoing change. Areas along the north and east coast lines and toward the central section of the Island have been rapidly urbanized. Plans for the industrial development of the western portion of the Island have been made and this should further stimulate the residential development of adjacent areas.

The outlook for Staten Island in the decades to come is one of continued growth and urban development; the population which stood at 220,000 in 1960 is expected to exceed 600,000 by 1990. Figure indicates the anticipated population growth rate of Staten Island from 1960 to 1990.

The Richmond Parkway will play an important role in this growth, serving the entire central sector of the Island and forming an important part of the Staten Island Arterial Highway System.

Staten Island Arterial Highway System

The Staten Island Arterial Highway System shown in Figure 1 will consist of expressways and parkways which will provide a sound traffic distribution pattern for the entire Island. Two of the expressways of this system, the Staten Island Expressway and the Willowbrook Expressway, have already been completed.

The Staten Island Expressway is the major east-west artery on the Island. It links the Verrazano-Narrows Bridge with the Goethals Bridge and the New Jersey Turnpike. It is in turn connected to the New Jersey industrial and waterfront areas and the Bayonne Bridge by the Willowbrook Expressway.

The Arterial Highway System will include two circumferential expressways, the Shore Front Drive and the West Shore Expressway. The Shore Front Drive follows generally along the east coastline of the Island and connects the Narrows Bridge to the Outerbridge Crossing. The western section of the Island is traversed by the West Shore Expressway. This expressway, which will service the industrial lands of the area, links the Outerbridge Crossing to the Staten Island Expressway.

Legislation leading to the completion of the belt expressway system along the north shore of the Island from the Goethals Bridge to the Narrows Bridge is presently

under consideration.

The remaining two planned arterial highways are the Willowbrook Parkway and the Richmond Parkway. The Willowbrook Parkway is a 5-mile limited access facility which originates at the Great Kills Park on the eastern shore line of the Island. Travelling in a northwesterly direction, it will connect directly into the existing Willowbrook Expressway at the Staten Island Expressway.

This report is primarily concerned with alternate routes to the Richmond Parkway. However, since the Richmond Parkway and the Willowbrook Parkway intersect within the study area, the effects of these alternate routes on the Willowbrook Parkway are also given consideration.

CONSIDERATIONS IN ALTERNATE ROUTE SELECTION

General

The location of any urban arterial highway involves the evaluation of many controlling factors. The principal considerations in selecting alternate routes to the Richmond Parkway have been: present and future land use, traffic, topography and physical features, geology and subsurface conditions, economic and social considerations, amenities and utilities. The controlling factors for the general area through which Section 1 of the Richmond Parkway will pass are reviewed in this section.

Present Land Use In The Study Area

In the study of alternate routes to Section 1, the influences of adjacent commercial, residential, institutional and recreational lands are major controls in location. It is essential that information regarding all of these influences, both existing and planned, be considered in the selection of a proper route.

The lands adjacent to Section 1 consist of an unusual admixture of public and private uses. The southerly part of Section 1 will cross the City-owned swamplands north of Arthur Kill Road. The northwestern section of this marshland, adjacent to Richmond Avenue, is the site of a sanitary land fill operation which presently covers an area of 64 acres.

cf. this is a magnificent view what about the Todt Hill overlook

Overlooking the marshland are two bluffs which offer a magnificent view of the Fresh Kills. The most westerly hill, known as Ketchum's Cemetery or Burial Hill, is the site of an old family burial ground. Crocheron Hill lies to the east of Burial Hill, and rises to a point 128 feet above Richmond Creek.

These hills form the southern periphery of the Latourette Park woodlands. Latourette Park is a City-owned park which offers the people of New York City an 18-hole golf course, picnic areas and nature trails. The main field house is located adjacent to Richmond Hill Road on the hill overlooking Richmondtown.

In the northern section of the Park lies a wooded valley known as Buck's Hollow. It extends along Rockland Avenue between Meisner Avenue and Forest Hill Road and is bounded on the south by the golf course. It consists of 125 acres of natural beech and oak woodland.

Lying at the foothills to the east of Latourette Park is the historic village of Richmondtown. In the vicinity of Richmondtown are some thirty historical landmarks dating from the days of the earliest Dutch settlers to the mid-nineteenth century. The Staten Island Historical Society and the Department of Parks have long term plans for the reconstruction of this colonial village. The Richmondtown Restoration is the only project of this nature in New York City and is expected to be a major attraction to the urban population of this area in the years to come.

Two miles to the northeast of Richmondtown along Richmond Road is the Moravian Cemetery, used by the United Brethren for over a century, and one of the most

beautiful in the country. It is handsomely landscaped with native, as well as exotic, trees and shrubs.

Immediately adjacent to and on the north side of the cemetery is the Richmond County Country Club. It lies on the gentle slopes below Todt Hill, and has a beautiful panoramic view of the Island.

On the west side of the Moravian Cemetery is High Rock Park, formerly the property of the Girl Scouts of America. The recent acquisition of this park by the City of New York for conservation purposes was a major step toward the preservation of the natural environment of the "Greenbelt" in this area.

Richmondtown, the Moravian Cemetery, the Richmond County Country Club and High Rock Park all are located to the east of the proposed Richmond Parkway. However, they are mentioned in this report because they form an integral part of the "Greenbelt," and are expected to generate some of the traffic which uses the Richmond Parkway.

The lands which are more directly affected by any alternate alignment of the Richmond Parkway lie to the west of the proposed route. This area is predominantly occupied by private campgrounds, institutional lands and parks.

Directly to the northeast of Latourette Park on the east side of Manor Road is the William H. Pouch Boy Scout Camp, owned by the Boy Scouts of America and used by Boy Scouts from all parts of New York City. The campgrounds include numerous glacial ponds and Orhbach Lake.

Immediately to the north of the Boy Scout Camp are the Henry Kaufmann Campgrounds. These campgrounds are operated by the United Jewish Philanthropies of America. They provide day camp facilities during the summer for over a thousand children between the ages of six and sixteen. The owners of the Kaufmann property have recently requested that the City Planning Commission demap portions of their property in order that they may expand their developed facilities from 47 acres to 72 acres.

The lands bounded by Manor Road on the east, Rockland Avenue on the south and Forest Hill Road on the west comprise the Sea View Hospital complex. This facility is operated by the New York City Department of Hospitals.

The portion of the hospital grounds on the west side of Brielle Avenue, the former site of the New York City Farm Colony, is presently being used quite extensively by the hospital.

The area on the east side of Brielle Avenue consists of buildings which were originally built around 1910 and a majority of these are not now being used. However, this part of the hospital complex is scheduled for rehabilitation in the near future and it is anticipated that the major portion of the hospital's activity will ultimately be transferred to this eastern side of Brielle Avenue.

In the northeast corner of the Sea View Hospital property is the site of the Susan B. Wagner High School. The school, which is presently under construction, will service the rapidly expanding residential area to the north.

The large tract of land between Forest Hill Road and the proposed Willowbrook Parkway is occupied by the Willowbrook State School. This facility, operated by

the New York State Department of Mental Hygiene, consists of an imposing group of buildings and is one of the most modern of mental institutions. The Willowbrook State School is presently involved in an expansion program and several major buildings are under construction.

Bordering the Willowbrook State School on the west is the 157-acre Willowbrook Park, operated by the New York City Department of Parks. Situated on the site of an old swamp, it has a lake which is used for fishing and rowing and facilities for softball, baseball, archery and picnicking.

To the west of Richmond Avenue, adjacent to Travis Avenue lies the William T. Davis Wildlife Refuge, established in 1956 and maintained by the Department of Parks. It consists of 260 acres of woodland, nature trails and marshland and acts as a sanctuary for birds and wildlife native to the area.

Future Land Use In The Study Area

The location of an alternate route is governed not only by today's developments, but also by developments likely to be completed within the serviceable life of the parkway.

Whereas the properties already mentioned have had their present land use for years, there remains a portion of the study area which is yet to be developed. The impact that development of this area will have on Staten Island and the traffic of the Richmond Parkway is expected to be very great indeed.

The area, commonly known as the "Heartland," is comprised of the lands

adjacent to Richmond Avenue between the Forest Hill Road Extension and Rockland Avenue. The City Planning Commission has under consideration that a major commercial, cultural and civic center be developed at this location.

The commercial area is planned on the site of the abandoned Staten Island Airport east of Richmond Avenue. The shopping center to be developed in this area will consist of over 160 acres and will be the largest in the metropolitan New York City area. Present plans for the center include at least three major department stores supplemented by approximately sixty specialty and service stores.

The site is already occupied by an E. J. Korvette store. The R. H. Macy Company is expected to begin construction of a store by mid-1967 with completion due by the fall of 1969. It is anticipated that when the commercial area is fully developed, there will be parking available for over 13,000 cars.

The cultural and civic center is planned for the 350 acres of City-owned land on the west side of Richmond Avenue, presently the site of a sanitary land fill operation. Preliminary plans envision a university complex, a sports stadium and various governmental buildings in this area. This center combined with the commercial area to the east is expected to make the "Heartland" one of the prime generators of traffic on Staten Island in the years to come. It must be given every consideration in the selection of any alternate route to the Richmond Parkway.

Over 550 acres of land to the north and east of the commercial area are presently zoned residential. Plans for the development of a 136-acre

site between Richmond Hill Road and Rockland Avenue have already been approved by the City Planning Commission. In addition, several smaller residential developments are presently under construction in this area. With the impetus provided by the construction of the commercial center, this area is expected to become rapidly saturated within the next ten years.

An additional area which should be mentioned in discussion of future land use in the study area is the tract of land to the west of the Susan B. Wagner High School, which is the proposed site of six radio towers for Station WNYC. This site has been approved by all City agencies and approval of the Federal Communications Commission is presently awaited.

Basic information related to the present and future land use in the study area has been obtained from data and maps provided by the New York City Planning Commission. Additional information pertaining to specific land use or future development has been obtained from the particular City agency having jurisdiction.

Traffic In The Study Area

An alternate route to the Richmond Parkway must not only cause a minimum of disruption of the existing and future land use, but it must at the same time provide a high level of traffic service to the community.

The pattern of the Staten Island Arterial Highway System evolves from the overall transportation needs of the Island. The Richmond Parkway and Willowbrook

Parkway form an integral part of this System and the traffic patterns of both are considered in this report.

The Richmond Parkway services the central corridor of the Island. Since the main attraction on Staten Island is its northeast section, 80 percent of the traffic using the Richmond Parkway is expected to be destined to either the Narrows Bridge or the St. George area.

Existing traffic reports indicate that 90 percent of the Richmond Parkway's traffic will be generated locally on Staten Island. Most of this local traffic will originate in the southern section between Bloomingdale Road and Richmond Avenue. As mentioned previously; this southern section generally follows the route of the existing Drumgoole Boulevard. The lands adjacent to Drumgoole Boulevard are zoned residential and are expected to develop with a uniform density of population. Ultimately this area will probably resemble the eastern section of Queens as it is today.

The proposed Willowbrook Parkway will connect the residential areas of the eastern central section of the Island with the Richmond Parkway, the Staten Island Expressway and the Willowbrook Expressway. Although the Willowbrook Parkway was originally conceived as a weekend recreational facility, it is also expected to meet the weekday traffic needs of the area it will service. It will be particularly important in providing convenient access to the "Heartland" for the population of the eastern part of the Island.

The right-of-way for the Willowbrook Parkway was acquired by New York

City in 1947. The route of the Parkway between the proposed Richmond Parkway interchange and Willowbrook Park follows a valley through the "Greenbelt" and has a minimum undesirable effect on the ridge. This report therefore assumes that the Willowbrook Parkway will be built as presently mapped.

The geometric elements of both the Richmond Parkway and Willowbrook Parkway in the study area are dependent upon the anticipated traffic volumes on these facilities. A traffic analysis of the study area was therefore essential to the selection of alternate routes.

From the outset of the study it was apparent that an origin and destination survey yielding the desire lines of travel on the Island would be of value in the preparation of this report. However, since a survey of this nature was beyond the scope of this study, it was decided that the basis for the traffic analysis would be recent traffic study reports on the Richmond and Willowbrook Parkways prepared by consultants for the New York State Department of Public Works.

Both traffic study reports developed their forecasts in essentially the same manner. They considered only weekday traffic with a modifying statement that weekend traffic would be heavier. In addition, their projections were based on the assumption that Staten Island would have no adequate mass transportation facilities in the future, and therefore, every family would have to depend on the

automobile for their daily travel trips.

The traffic projections in these reports were developed by considering four principal factors: the population expansion of the areas adjacent to the parkways, the probable future land use of these areas, the expansion of present traffic to the design year and, finally, the assignment of the future traffic to the various roadways.

These reports, although adequate for the purposes they were originally intended, proved to have limitations when applied to this study. The relative magnitudes of the major desire lines on Staten Island could not be reconstructed from these reports. In addition, the origin of traffic assigned to some of the interchanges along the Richmond Parkway could not be accurately determined. It thus became difficult to reassign traffic on some of the alternate alignments.

The need for a more detailed analysis of the traffic became increasingly apparent when two of the alternates studied revealed a considerable diversion of traffic from the proposed Richmond Parkway. As a result, the New York State Department of Public Works requested the Tri-State Transportation Committee to simulate the traffic on the various alternates and determine their effect on the local street system and the entire Arterial Highway network.

The data obtained from this traffic simulation program would be invaluable in the preparation of this report. It would be useful in determining the number of lanes on the parkway where considerable diversion is anticipated, and in addition, it would aid considerably in determining which cross roads should be provided

with interchange facilities. It is therefore recommended that the traffic assignments made in this study be re-evaluated upon receipt of the Tri-State simulation report.

Topography and Physical Features of the Study Area

An alternate route to the Richmond Parkway must have a minimum effect on the natural terrain and man-made culture. The topography and physical features of the area therefore determine to a great extent such design elements of the parkway as: alignment, gradient and drainage.

The topography within the study area varies considerably. The terrain ranges from the flat marshland adjacent to Richmond Creek to the steep slopes of Todt Hill. The watercourses, bluffs, hills, valleys and steep slopes all impose limitations on location and design of an alternate route.

Physical features such as valuable commercial, residential and institutional buildings have been carefully considered and the parkway aligned to avoid them wherever possible.

To determine the topography and physical features, it was necessary to specially prepare from up-to-date aerial photography, a 1" = 200' scale, 5' contour interval topographic map of the area. Detailed route selection was conducted on this map. Additional information relating to topography and physical features was obtained from 1" = 400' scale aerial photographs of the area, U.S.C. & G.S. quadrangle maps, building and property maps and on-the-site field investigations.

Geology and Subsurface Conditions of The Study Area

The native bedrock of the area is serpentine. The thickness of the soil cover over the bedrock varies considerably; however, it is anticipated that the underlying serpentine is sufficiently deep that rock excavation will not be an important feature of construction cost.

In general, the soil within the study area was deposited as unstratified ground moraine during the Wisconsin glaciation. The principal exception to this is the hilly terrain in the vicinity of Todt Hill which is characteristic of the terminal moraine phase.

The soils within the study area are generally good. An average depth of one foot of organic topsoil is anticipated throughout. The types of soil vary considerably from clay fractions to boulders; however, silts and fine sands are predominant.

The swamps adjoining Richmond Creek and Springville Creek consist of meadow mat and gray organic silts averaging ten feet in depth. Such deposits must be removed before a parkway embankment can be placed in these areas. The sanitary land fill adjacent to these marshlands must also be excavated when traversed by the parkway.

Scattered areas of swamp deposits and high ground-water table are located throughout the Willowbrook Park and the Willowbrook Expressway-Staten Island Expressway interchange area. The anticipated depth of muck removal in these areas ranges up to four feet.

Geologic and subsurface information has been obtained from boring logs provided by the New York State Department of Public Works and thirty borings, ranging in depth from twenty feet to sixty feet, taken specifically for this study. The data obtained from these borings has been supplemented by on-the-site field investigations, auger holes, probings, seismic investigations and stereoscopic study of aerial photographs.

General Social And Economic Considerations

Any alternate route to Section 1 will require the extensive acquisition of private property. With property values on Staten Island rising rapidly, the determination of right-of-way acquisition costs has been a major aspect of the study.

The basis for the determination of acquisition costs has been the assessed valuation of the properties affected. True market value has been established by the New York City Corporation Counsel after individual study of each parcel to be acquired.

In addition to the cost, a special consideration in right-of-way acquisition is the number of houses and businesses to be acquired. Closely related, and of equal importance, is the number of families dislocated and the number of employees in businesses affected by an alternate route. Every attempt has been made in this study to minimize these types of acquisition along the parkway route.

The lands between Forest Hill Road Extension and the Willowbrook Parkway

are zoned residential. The present home building activity in this area, and that planned in the near future, presents a potentially serious acquisition problem along any route. The need for the prompt selection of an alternate route, and the immediate mapping of these residential lands for acquisition, is of paramount importance in obtaining a feasible alternate route.

Additional costs considered in the evaluation are: construction costs, costs of engineering services and the costs incurred by previous investments in land and construction which may not be utilized by an alternate route.

In general, the construction costs for the alternate routes are based on the Engineer's Estimate for items of similar work on the original Section 1 construction contract.

The costs of engineering services include the costs for survey, mapping, borings and preparation of preliminary and contract plans.

The abandonment of the existing three-level interchange constructed for the Richmond Parkway and Staten Island Expressway is an example of a previous investment which when not utilized by the various alternate routes must be considered as a cost in this evaluation.

The above-mentioned costs must be weighed against the route's value to the community as a whole. In a road-user benefit analysis the value of an arterial highway improvement is generally expressed in terms of benefits and advantages to the road user and municipality.

The road-user benefit analysis for this report uses the existing local street system as a basis for comparison of the various alternate routes. Items which have been considered in the road user costs for the analysis are: vehicle operating costs, savings in time, and comfort and convenience. Other items such as tax revenues, aesthetics, new development and property values have not been considered in the analysis.

A further consideration in determining each route's value to the community is that the additional cost of an alternate route for Section 1 over the cost of the original parkway route must be weighed against the value of an undisturbed "Greenbelt" to the people of the City of New York.

Other General Considerations In Alternate Route Selection

Two other considerations which will influence route selection are amenities and utilities.

A pleasing appearance is required of a parkway. Continuous smooth flowing horizontal alignment and profiles are key elements in providing a pleasing appearance. Each alternate route has been located to fit the landscape wherever possible, and thereby become an asset to the areas through which it passes. Sufficient width of right-of-way has been provided to assure a buffer of natural growth between the parkway and adjacent lands.

Existing and future utilities such as storm and sanitary sewers, water, telephone,

gas and electric, affected by each alternate have been taken into account in route selection.

The City of New York Department of Public Works' proposed drainage plan for sanitary and storm sewers in the area has been considered in the establishing of profiles on the alternate routes.

Existing water mains have been located from data supplied by the City of New York Department of Water Supply, Gas and Electricity and relocation costs related to these mains have been included in the construction estimates.

The private utility companies in the area are the New York Telephone Company, the Brooklyn Union Gas Company and Consolidated Edison. Any relocation of private utilities is to be performed by the owning company.

The only major construction planned by these private utility companies is a 345 KV underground pipe type feeder which will cross the northern section of the study area. However, the location of this line has not been finalized, and it has not been a major consideration in this report.

ALTERNATE ROUTES OF THE PRELIMINARY REPORT

Concepts of The Preliminary Report

A preliminary investigation and its report entitled "Alternate Routes for the Proposed Richmond Parkway," indicated that five alternate alignments located to the west of the originally proposed parkway offered the prospect of minimum impact on the "Greenbelt." These five alternate routes fell within two general study corridors.

One of the corridors followed the band of interest of the originally proposed route, passing through the institutional lands north of Latourette Park to terminate at the existing three-level interchange at the Staten Island Expressway. Three alternates, designated 1, 2 and 3, were contained within this corridor.

Alternates 4 and 5, located in the second corridor of study, generally followed Richmond Avenue northward to the Willowbrook Expressway-Staten Island Expressway interchange.

Figure is a 1" = 2000' scale aerial mosaic of the study area showing the five alternate alignments discussed in the preliminary report.

The preliminary report also suggested the possibility of constructing the entire nine miles of the Richmond Parkway to expressway standards. However, this concept was subsequently set aside when the New York State Department of Public Works awarded the construction contract for Section 2 of the Richmond Parkway as a parkway.

Elimination of Alternates 1 and 2

Of the five alternates discussed in the preliminary report, Numbers 2, 3, 4 and 5 were selected by the Department of Highways for further study. Figure is a map of the study area showing the location of these alternate routes.

Alternate 1, the route originally proposed by the Staten Island Citizen's Planning Committee, was eliminated from study in this report because it required the extensive acquisition of homes in the Todt Hill area.

One of the initial steps in the preparation of this report was the establishment on 200' scale maps of horizontal alignments for the four remaining alternates. The two alternates in each corridor were then compared, in an attempt to select one alternate from each corridor for further study.

Within the study corridor containing Alternate Routes 2 and 3, Alternate 3 was selected for detailed study, being generally preferred to Alternate 2 for two principal reasons. First, it follows more closely the route of the proposed Richmond Parkway, fits the desire line of travel of traffic using the Parkway better, and creates a minimum of distortion in the highway spacing of the Staten Island Arterial Highway System.

Secondly, the route of Alternate 2 passes through the heart of the proposed residential area north of Richmond Hill Road, while that of Alternate 3 follows along the easterly edge of this area. Alternate 3 was therefore considered more desirable from the standpoint of efficient land use.

Alternate 3 was considered superior on the basis of both traffic and land use, and Alternate 2 was therefore eliminated from further study. A 1" = 600' scale plan of Alternate 2 has been included in this report for reference purposes.

The selection of a route for detailed study in the Alternate 4 and 5 corridor proved more difficult. It was decided that a selection between these alternates could not be made on the basis of horizontal alignment studies along. Alternates 4 and 5 were therefore considered in detail as part of this study.

The body of this report consists of a detailed analysis and evaluation of the engineering aspects of the three remaining Alternates 3, 4 and 5.

DESIGN CRITERIA

In order that the geometric elements for the alternate routes be comparable to the originally proposed route, the following similar criteria were established as the basis for design and location.

1. Design Speed.

a. Richmond Parkway	60 MPH
b. Frontage Roads	30 MPH
c. Cross Streets	40 MPH
d. Direct Connections	40 MPH
e. Ramps	30 MPH

2. Traffic Capacity

   a. Richmond Parkway — 1500 vehicles/hour/lane*

   *Capacities of ramps and weaving sections to be based on "1965 Highway Capacity Manual" published by the Highway Research Board.

3. Minimum Sight Distance

   a. Richmond Parkway — 475 feet

   b. Frontage Roads — 200 feet

   c. Cross Streets — 275 feet

   d. Direct Connections — 275 feet

   e. Ramps — 200 feet

4. Minimum Radius of Horizontal Curve

   a. Richmond Parkway — 1910 feet (desirable)

   1500 feet (absolute)

5. Maximum Gradient

   a. Richmond Parkway — 3.0% (desirable)

   5.0% (absolute)

6. Minimum Gradient

   a. Richmond Parkway — 0.5%

7. Right-of-way

   A 250-foot minimum width of right-of-way with full control of access is to be acquired. A 50-foot wide right-of-way for service roads is to be acquired

where it is necessary to maintain the traffic circulation pattern of the mapped street system.

8. Typical Sections

   a. Richmond Parkway - Two 24-foot wide roadways with a 46-foot wide median are to be constructed initially. Provision is to be made such that a 12-foot lane may be added on the median side of each roadway. The parkway pave- is to consist of 8 inches of concrete over 12 inches of foundation course. A 10-foot flush asphalt shoulder with curb is to be provided on the right side in the direction of travel and a 4-foot asphalt shoulder on the left side.

   b. Service Roads - 32-foot wide service roads consisting of 2 1/2 inches of asphalt and 6 inches of concrete foundation on 8 inches of foundation course are to be constructed as required.

   c. Cross Streets - The widths of cross streets vary from 24 feet to 70 feet. The pavement is to consist of 2 1/2 inches of asphalt and 6 inches of concrete foundation on 8 inches of foundation course.

9. Bridges - The highway bridges are to be composite steel beam construction with solid abutments and wingwalls. Brick facing is to be used on the wingwalls. Bridges are to be constructed to allow for 50-foot minimum width of pavement on all cross streets. The bridge across the relocated Richmond Creek is a 144-foot span plate girder with stub abutments.

10. Drainage - All drainage is to be collected into a positive system which discharges into existing streams and drainage courses.

11. Maximum Superelevation

a. Richmond Parkway	5/8 inches/foot
b. Ramps	1 inch/foot
c. Bridges	5/8 inches/foot

12. General - All other elements of design are to conform to accepted parkway standards.

DESCRIPTION OF ALTERNATE 3

General

The southerly sector of Alternate 3 will follow the route of the proposed Richmond Parkway across the swamplands of Richmond Creek. The construction in this area will be identical in nature to that proposed under the original contract plans. This will include the construction of two ramps on the north side of Richmond Avenue, the relocation of Richmond Creek, and the construction of a bridge over the relocated Creek.

From the marshland the Parkway will curve to the west of the original route and pass between the two bluffs overlooking the Creek. To the rear of the bluffs the Parkway will cross a major watercourse which drains the entire Latourette golf course and a pair of lakes to the north.

The Parkway will continue northward through the woodlands of Latourette Park until it passes under the proposed extension of Forest Hill Road.

Between the Forest Hill Road Extension and Richmond Hill Road, the Parkway is to be constructed as a depressed roadway with two parallel one-way service roads. A split diamond-type interchange is provided between these two roadways to service the adjacent commercial, residential and park lands.

An integral part of the construction program in this area will be the Forest Hill Road Extension between Richmond Avenue and Richmond Hill Road.

To the north of Richmond Hill Road the Parkway will continue as a depressed roadway between the proposed residential area and the expensive homes which front on the Latourette Park golf course.

The Parkway will emerge from the residential area as it passes under Forest Hill Road. It will proceed northward, crossing under Rockland Avenue and cutting through the southerly ridge line of Buck's Hollow. As the Parkway crosses Buck's Hollow, it will pass over the proposed Willowbrook Parkway.

A full cloverleaf will be provided for the interchange of traffic between the two parkways. The construction in this area will include the relocation of 2600 feet of Rockland Avenue along the hillside to the south of the interchange, and the relocation of 600 feet of Brielle Avenue in the vicinity of its intersection with Rockland Avenue.

From the Willowbrook Parkway interchange the Richmond Parkway will begin its ascent toward Todt Hill, rising steadily and generally remaining in cut, as it sweeps across the grounds of the Sea View Hospital complex. It will pass under Brielle Avenue, and relocation of the main access drive to the eastern portion of the hospital will be required. A hospital access road to the west of the Parkway will also require relocation.

After the Parkway passes under Brielle Road, it will swing toward the east and follow a route between the hospital buildings and the proposed site of the WNYC radio towers. It will cross a large swale, continue on fill past the Susan B. Wagner

High School, and pass over Manor Road.

A diamond interchange is provided at Manor Road.

After crossing Manor Road, the Parkway will enter upon the "Greenbelt" for the first time. It will proceed northward for a distance of three thousand feet, through the Henry Kaufmann Campgrounds. A pedestrian underpass at Station R444 and a pedestrian overpass at Station R452 are provided to link the two portions of the Kaufmann property severed by the Parkway.

The Parkway will curve past the residential area presently being developed at Todt Hill, and in the vicinity of Todt Hill Road, will return to the original Section 1 alignment. An interchange similar in design to the original interchange is to be provided at Todt Hill Road-Ocean Terrace.

From Todt Hill Road the Parkway will continue along the alignment of the original route and finally terminate as it connects into the existing three-level interchange with the Staten Island Expressway.

Land Use

The route of Alternate 3 will generally fit the framework of existing and future land use in the areas through which it will pass. There are, however, three areas which merit discussion here.

The lands between the Parkway crossings at the Forest Hill Road Extension and Forest Hill Road are zoned residential. North of Richmond Hill Road the Parkway

will pass between the proposed large-scale housing development and the expensive custom-built homes which overlook the golf course.

Good planning and land utilization emphasize self-contained neighborhoods, and attempt to separate neighborhoods rather than break through them. The character and quality of the development on either side of the Parkway in this area will differ considerably. A depressed parkway separating these two areas is therefore not considered objectionable.

A variation in Alternate 3 which would traverse the westerly perimeter of the golf course has been considered in this study. However, this variation would require the reconstruction of a sizable portion of the golf course and probably the closing down of the golf course during the construction period.

To the north of the Willowbrook Parkway interchange, the Parkway will cross the Sea View Hospital grounds. It will cut through the two portions of the hospital complex much as Brielle Avenue presently does. Since the Department of Hospitals ultimately expects to rehabilitate the eastern portion of the complex, it is their desire to have as much property as possible on the east side of the Parkway. If Alternate 3 is selected as the most feasible route, further study of alignments several hundred feet to the west through the buildings considered expendable by the Department of Hospitals should be considered during the preliminary design stage.

The Henry Kaufmann Campgrounds is a large piece of property in private ownership which would be bisected by the Parkway. Approximately, 14 acres

of land will have to be acquired for the Parkway right-of-way in this area. This acquisition will leave the Kaufmann Camp with 42 acres of land to the west of the Parkway and 16 acres of land on the east side. The westerly section is the portion of the campgrounds which is presently developed and used extensively. This section is to be linked to the undeveloped section on the east side of the property by two pedestrian crossings.

Traffic

Of the routes studied, Alternate 3 will follow closest to the original parkway. The traffic volumes and distributions of Alternate 3 will therefore be essentially the same as for the proposed Richmond Parkway. Figure shows a traffic flow diagram for this alternate.

The 1986 AADT is 66,600. The 1986 DHV of 4330 will require the ultimate construction of three lanes in each direction.

The effect of this alternate route on the remainder of the Staten Island Arterial Highway System traffic patterns is expected to be negligible.

Interchanges have been provided at Richmond Avenue, Forest Hill Road Extension-Richmond Hill Road, Willowbrook Parkway, Manor Road and Todt Hill Road-Ocean Terrace.

The two ramps provided on the north side of Richmond Avenue will be at the same locations as in the original contract plans. These ramps will complete the Richmond Avenue-Arthur Kill Road interchange.

The interchange facilities provided at Forest Hill Road Extension-Richmond

Hill Road, combined with the construction of the Forest Hill Road Extension, provide an efficient traffic circulation pattern adjacent to the "Heartland" commercial area. This arrangement will also allow for direct access to Latourette Park without costly improvement of local streets. These facilities are to be supplemented by the conversion of Richmond Avenue into a 210-foot boulevard-type facility under the Department of Highways construction program.

A full cloverleaf interchange has been provided between the Richmond Parkway and the Willowbrook Parkway. Weaving distances between the inner loops have been established in excess of 800 feet. This will provide a minimum service level B operation in the interchange area.

In addition, under this alternate, modification is necessary to the Willowbrook Parkway-Forest Hill Road interchange. To accommodate level of service B operation for the weaving movements between the interchanges of Willowbrook Parkway with Forest Hill Road and Richmond Parkway, a minimum weaving distance of 900 feet is provided.

The original parkway design had provision for local traffic from Manor Road and Rockland Avenue to enter the Richmond Parkway at the Willowbrook Parkway interchange. The origin of this traffic cannot be accurately reconstructed from the Richmond Parkway Traffic Report.

In order to remove the interference of local traffic from the Richmond Parkway-Willowbrook Parkway interchange, this originally considered local

movement has been relocated to Manor Road. A diamond interchange is provided at this location.

If further study in the preliminary design stage indicates the need for an interchange for local traffic in the Rockland Avenue area, provision can be made for all movements within the right-of-way to be acquired.

Right-of-way for future service roads from Forest Hill Road Extension to Willowbrook Parkway and in the area north of Manor Road is to be acquired in order to maintain the traffic circulation pattern of the mapped street system.

Alternate 3 will provide convenient access to Richmondtown. Southbound Richmond Parkway traffic will reach Richmondtown by exiting at Richmond Hill Road and proceeding 0.8 mile to the west. Northbound Richmond Parkway traffic will either exit at Forest Hill Road Extension and continue westward along Richmond Hill Road for 0.8 mile or exit at Arthur Kill Road and follow this roadway 2.0 miles to Richmondtown.

Topography and Physical Features

Alternate 3 presents a generally curvilinear alignment which avoids any major buildings along the route.

Most of the radii used along this alternate are in the range of 2,800 feet to 8,000 feet. The minimum radius used will be a 2,000-foot radius in the vicinity of the Henry Kaufmann Campgrounds.

Although Alternate 3 traverses the more rugged terrain in the Todt Hill section of the study area, the gradients used along this route are satisfactory for a parkway.

To the south of the Willowbrook interchange, all grades are below the maximum desirable gradient of three percent. To the north of the Willowbrook Parkway, there are three areas where a three percent grade is exceeded.

The drainage along this route presents no problems. The Parkway low point, located at Station 265+45, is to be drained directly into Richmond Creek.

There are numerous water courses and swales which cross the Parkway route and which can be used for discharging storm water runoff.

One final comment is relevant to topographical considerations of this alternate. The Richmond Parkway-Willowbrook Parkway interchange is situated in a valley. This site is adaptable to a direct connection type interchange which would require less area than the cloverleaf. If this alternate is selected for further study, a direct connection interchange should be studied during the preliminary design stages.

Geology and Subsurface Conditions

At its southern end, Alternate 3 will pass over the Richmond Creek swamp on basically the same alignment as the proposed Richmond Parkway. The removal of the top layer of organic silt will be required in this area and will involve the excavation of approximately 380,000 cubic yards of material between Richmond Avenue and Station 294. The areas of unsuitable material which are excavated will have to be backfilled with select granular material placed to a height of two feet above the water surface. This will require approximately 400,000 cubic yards of such material.

The soils along the remainder of the route of this alternate are good. They consist generally of a foot of topsoil underlain by sand and silt with a trace of gravel.

The subsurface conditions at the bridge sites and the probable foundation treatment are as follows:

Relocated Richmond Creek -

Forest Hill Road Extension -

Richmond Hill Road - (Subsurface Information Awaits Completion of Borings.)

Forest Hill Road -

Relocated Rockland Avenue -

Willowbrook Parkway -

Brielle Avenue -

Manor Road -

Todt Hill Road-Ocean Terrace -

Borings taken at the Richmond Hill Road and Forest Hill Road bridge sites indicate ground water within feet of the ground surface. The more silty textured soils in this area possess imperfect internal drainage and high capillarity. Since the Parkway is to be constructed as a depressed roadway in this area, seepage along the cut side slopes may present a problem. However, a gravel blanket placed along these side slopes with an underdrain at the bottom of the cut ditch will minimize the maintenance problems associated with this seepage.

Social and Economic Considerations

Approximately 65% of the route traversed by Alternate 3 will be across publicly owned lands. The acquisition of private property will be required only

in the sections from Forest Hill Road Extension to the Willowbrook Parkway and Manor Road to Todt Hill Road.

The remainder of the route will pass through the City-owned lands of Latourette Park and Sea View Hospital.

Acquisition of the following buildings will be required under Alternate 3:

9 houses

1 garage

4 barns

1 incinerator

6 sheds

1 shelter

22 Buildings Total

Of the nine houses acquired, two are not occupied at the present time. This route will therefore require the dislocation of seven families.

There are two areas along this route in which home building activity appears imminent. In the vicinity of Station R360 a development of approximately thirty-five homes is planned. Three model homes have already been completed along Forest Hill Road, and a portion of the area cleared. As of the date of this report, no building permits have been issued for construction within the projected right-of-way for Alternate 3.

A second development 600 feet east of Forest Hill Road on the north side of

Rockland Avenue has also been started. There are approximately forty building plots in this area, and the land has been cleared. A model home has also been constructed at this site; however, as of the date of this report, no building permits have been issued.

The incinerator indicated in the listing of buildings to be acquired is located at Station 393+80, 140 feet left. It is part of the Sea View Hospital, but is presently not in use. Its acquisition would be for a future service road and immediate demolition of this building would not be required.

Estimated costs for Alternate 3 are tabulated:

Right-of-way Acquisition	$ 3,000,000*
Construction	18,200,000
Engineering Services (7% Construction)	1,300,000
Subtotal	$22,500,000
Lost Investment	1,000,000
Total	$23,500,000

A detailed breakdown of the properties affected is shown in Table

Construction cost is detailed in Table 1.

Lost investment refers to the investments made in the preparation of preliminary and contract plans for the original route.

A road-user benefit ratio of 3.5 is obtained for this alternate.

*Acquisition cost based on equalization factor of 2.0 for purposes of this preliminary draft.

Alternate 3

TABLE 1

Clearing and Grubbing	$ 90,000
Earthwork	3,500,000
Drainage	3,000,000
Structures	4,200,000
Pavement	2,900,000
Shoulders	470,000
Curb	280,000
Maintenance of Traffic	270,000
Guide Rail	160,000
Fence	240,000
Lighting	1,600,000
Water Mains	230,000
Police Telephone	150,000
Miscellaneous Utilities	80,000
Signs	300,000
Landscaping	250,000
Miscellaneous	480,000
Total Construction Cost	$18,200,000

Other Considerations

For aesthetic reasons the route of Alternate 3 has been depressed in the vicinity of residential areas and the Sea View Hospital. Through the Henry Kaufmann property, it has been located to fit the natural terrain as nearly as possible.

Consideration should be given to the acquisition of scenic lands adjacent to the Parkway in the Todt Hill section. Federal funds are presently available for highway beautification purposes such as this.

The future drainage plan of the area requires only minor modification under this alternate.

Existing water lines along Richmond Hill Road, Forest Hill Road, Rockland Avenue, Brielle Avenue and Manor Road will have to be relocated or adjusted.

DESCRIPTION OF ALTERNATE 4

General

From the junction of the Richmond Parkway Sections 1 and 2, the alignment of Alternate 4 will swing to the west of the original parkway route across the Richmond Creek marshlands. The construction in this area is similar to Alternate 3 and will include two ramps on the north side of Richmond Avenue, the relocation of Richmond Creek, and a bridge over the relocated creek.

After crossing the swampland north of the creek, the Parkway will pass through the sanitary land fill for a distance of 1,200 feet. It will continue along the west side of Burial Hill, leaving the Parklands as it passes under Forest Hill Road Extension.

Between Forest Hill Road Extension and Richmond Hill Road, the Parkway will be constructed as a depressed roadway along the easterly perimeter of the proposed commercial area. A split diamond interchange connected by parallel one-way service roads is to be provided between these two roads.

The construction of Forest Hill Road Extension between Richmond Avenue and the Parkway will also be required as part of the work under this alternate.

The Parkway will cross under Richmond Hill Road, and continue northward in cut through the proposed residential area. In the vicinity of Rockland Avenue it will follow a route just to the east of a housing development where twenty-nine homes are presently under construction. It will rise over Rockland Avenue and

curve to the northwest to join with the proposed Willowbrook Parkway.

A direct connection interchange between the two Parkways is to be provided in this area. It will be located between a small residential development of twelve homes on the west and a recently constructed Swim Club facility on the east. The interchange will consist of six bridges, all of which may be constructed under the Willowbrook Parkway construction program.

The two parkways will converge and continue as four-lane roadways for a distance of 2,200 feet along the easterly perimeter of Willowbrook Park. At Victory Boulevard a partial cloverleaf is to be constructed. The easterly side of this interchange will require the relocation of the main access drive to the Willowbrook State School.

The parkways will connect into the Staten Island Expressway at the interchange already constructed for the Willowbrook Expressway. The direct connection from the Richmond Parkway northbound to the Staten Island Expressway eastbound will require the construction of a bridge over Victory Boulevard and the widening of the Staten Island Expressway to a point approximately 800 feet west of the Wooley Avenue Bridge. The construction of this direct connection will also require the relocation of 2,200 feet of the south service road in this area.

The return movement of the Staten Island Expressway westbound to the Richmond Parkway southbound will be accommodated by the construction of a 1,200 foot long three-level viaduct which will pass over the Staten Island Expressway and the

Willowbrook Parkway. The construction of the direct connection for this viaduct will require the reconstruction of 1,900 feet of service road and of 1,800 feet of ramp on the north side of the interchange, and of 1,600 feet of service road on the south side.

Land Use

Three areas along the route of Alternate 4 merit attention in a discussion of land use.

Between Forest Hill Road Extension and Richmond Hill Road, the Parkway will pass immediately adjacent to the proposed commercial area. In this section the Parkway will effectively separate the residential area on the east side from the commercial lands to the west and enable these lands to be utilized more satisfactorily.

To the north of Richmond Hill Road, however, the Parkway will cut through the heart of the proposed large-scale residential development. Although considerable acreage will remain on either side of the Parkway for residential use, good land use would preferably locate such a Parkway on the outer perimeter of the residential area rather than passing through it.

Finally, to the north of Rockland Avenue the Richmond Parkway will follow the route of the proposed Willowbrook Parkway. The Parkway in this area acts as a buffer between the Willowbrook Park and the Willowbrook State School.

Traffic

The Staten Island Arterial Highway System as presently planned consists of

three major north-south arteries, the Shore Front Drive, the Richmond Parkway, and the West Shore Expressway. These three arteries will be equally spaced throughout the length of Staten Island and will provide a sound, well-planned traffic distribution system for the people of the Island.

The connection of Alternate 4 into the Staten Island Expressway at the Willowbrook Expressway interchange significantly alters this Arterial Highway network. A traffic analysis of Alternate 4, using the Richmond Parkway and Willowbrook Parkway Traffic Reports as a basis, revealed that the relocation of the Richmond Parkway 2.5 miles to the west would, in effect, divert a considerable amount of traffic from it.

The net loss to the Richmond Parkway-Willowbrook Parkway system in this area is estimated to be 1,000 vehicles per hour (vph) during the peak hour.

The traffic analysis reveals that a large percentage of the traffic diverted from the parkways will use local streets such as Hylan Boulevard, Amboy Road and Richmond Road. These streets will have to be upgraded to absorb this surcharge.

Hylan Boulevard is already under improvement. The Department of Highways has scheduled the improvement of Amboy Road on its construction program and Richmond Road is to be added in the near future.

Alternate 4 is also expected to affect the traffic patterns on other portions of the Staten Island Arterial Highway System. The Shore Front Drive will be expected to absorb some of the diverted parkway traffic mentioned previously. In addition, the section of the Staten Island Expressway between the Willowbrook Expressway

interchange and the three-level interchange will be required to accommodate more traffic than was originally planned.

The traffic flow diagram for Alternate 4 is shown in Figure

The 1986 AADT is 64,700. The 1986 DHV of 4205 requires the ultimate construction of three lanes in each direction.

Attention is drawn to the fact that the diversion of traffic mentioned above will allow the Willowbrook Parkway in this area to be constructed with only two lanes in each direction.

The original route of Section 1 has an interchange with the Staten Island Expressway approximately 2.5 miles east of the Willowbrook Expressway-Staten Island Expressway interchange. This provides a satisfactory spacing between these two major interchanges in an urban area and assures a smooth free flow of traffic both along the Staten Island Expressway and through the interchange areas.

The relocation of the Richmond Parkway to terminate at the Willowbrook Expressway-Staten Island Expressway interchange concentrates the traffic loads of four major arteries into one interchanging area, creating potentially serious operational problems.

A discussion of this interchange complex must begin with the approach section of the interchange. This approach will consist of a 2,200-foot section where the Richmond Parkway and the Willowbrook Parkway run jointly as a four-lane roadway. The traffic along this roadway will consist primarily of merging

movements.

The traffic flow diagram indicates that the Richmond Parkway volume approaching this section will be 3,385 vph. Approximately seventy-five percent of this traffic (2,560 vph) will be destined to the northeast section of Staten Island. The remaining twenty-five percent (825 vph) will be destined to either the Bayonne Bridge or the Goethals Bridge.

The traffic flow diagram also indicates that the volume of traffic on the Willowbrook Parkway approach will be 1,550 vph, all but 120 vph (1,430 vph) destined to either the Bayonne Bridge or the Goethals Bridge.

To eliminate a major weaving movement between these two parkways, the Willowbrook Parkway will be bridged across the Richmond Parkway, requiring only 945 vph to weave in this section.

A partial cloverleaf interchange will be provided at Victory Boulevard. Approximately half the traffic destined for the St. George area of Staten Island will exit at this point, the remainder to continue eastbound on the Staten Island Expressway. The return movement of Victory Boulevard to Richmond Parkway-Willowbrook Parkway southbound is provided by a loop on the west side of the interchange.

For traffic from Victory Boulevard to the Staten Island Expressway eastbound, a loop will be provided. This loop will replace an existing slip ramp between the south service road and the Staten Island Expressway.

The Victory Boulevard to Willowbrook Expressway northbound movement will be accommodated by a slip ramp in the northeast quadrant of the Staten Island Expressway interchange. The return movement from Willowbrook Expressway southbound to Victory Boulevard will be provided for by a ramp off the existing Willowbrook Expressway southbound-Staten Island Expressway eastbound direct connection.

Two Victory Boulevard movements have not been provided for in this interchange. These are the Victory Boulevard to Staten Island Expressway westbound movement and its return movement. Each of these is estimated to be approximately 65 vph and is considered minor in nature. Traffic desiring to make these movements can be accommodated with a minimum of inconvenience at adjacent interchanges.

Under this alternate the existing Willowbrook Expressway-Staten Island Expressway interchange will be supplemented with the addition of two direct connections. These connections provide for traffic movements from the Staten Island Expressway westbound to Richmond Parkway southbound and return.

The Richmond Parkway northbound-Staten Island Expressway eastbound connection will be made 1,000 feet beyond the end of the acceleration lane for the Willowbrook Expressway southbound-Staten Island Expressway eastbound direct connection. The Richmond Parkway connection will consist of two lanes which will merge into the three Staten Island Expressway through lanes over a distance of 1,300 feet.

Although the interchange treatment proposed meets all the accepted criteria

for interchange design, the efficient operation of this interchange will rely heavily on proper signing.

The majority of traffic using this interchange during peak hour flow is local commuter traffic, familiar with the operations of complex interchanges in urban areas. This can be expected to facilitate operations of the approach section and interchange area.

No discussion of this interchange is complete without attention to the possibility of future congestion. Recent experience in the Metropolitan New York City area has been that newly constructed highways reach their design capacities considerably in advance of the forecast year. The geometrics provided are adequate for the projected traffic indicated but do not provide a wide margin for efficient operation beyond this projection.

The remainder of the traffic on Alternate 4 will be similar in nature to the original Parkway and present no major problems. In addition to the Victory Boulevard-Staten Island Expressway interchange complex, interchanges are provided for at Richmond Avenue, Forest Hill Road Extension-Richmond Hill Road and the Willowbrook Parkway.

The two ramps on the north side of Richmond Avenue will be at the same locations as in the original contract plans. These ramps will complete the Richmond Avenue-Arthur Kill Road interchange.

The Forest Hill Road Extension-Richmond Hill Road split diamond interchange

will furnish an efficient traffic circulation pattern along the outer perimeter of the "Heartland." The southbound service road will pass immediately adjacent to the proposed commercial area and will provide direct access to the parking areas of the shopping center.

The improvement of Richmond Avenue mentioned under Alternate 3 will also become part of the Department of Highways construction program under this alternate.

A direct connection interchange has been provided between the Richmond Parkway and the Willowbrook Parkway. A direct connection requiring the construction of four bridges will be furnished for the Willowbrook Parkway northbound to Richmond Parkway southbound movement. This movement is expected to be important in the future as it will provide direct parkway access to the "Heartland" for the eastern population of the Island.

As indicated, the original Parkway design had provision for local traffic from Manor Road and Rockland Avenue to enter the Richmond Parkway at the Willowbrook Parkway interchange. The origin of this traffic cannot be accurately reconstructed from the Richmond Parkway Traffic Report.

Further study in the preliminary design stage may indicate a considerable amount of traffic generating in the Rockland Avenue area. This traffic will be able to use the improved Richmond Avenue facility.

Between Richmond Hill Road and Rockland Avenue right-of-way for future

service roads is to be acquired in order that the traffic circulation pattern of the mapped street system may be maintained.

Alternate 4 will provide convenient access to Richmondtown. Southbound Richmond Parkway traffic will reach Richmondtown by exiting at Richmond Hill Road and proceeding 1.2 miles to the west. Northbound Richmond Parkway traffic will either exit at Forest Hill Road Extension and continue westward along Richmond Hill Road for 1.4 miles or exit at Arthur Kill Road and follow this roadway 2.0 miles to Richmondtown.

Topography and Physical Features

Alternate 4 presents a direct alignment between Richmond Avenue and the Staten Island Expressway. No major buildings have to be acquired for this route.

The minimum radius required on this alternate is 1,910 feet, along the southbound roadway in the Willowbrook Parkway interchange.

The grades used along this route are good. None exceeds the maximum desirable gradient established by the design criteria. The steepest gradients are of three percent, crossing the Rockland Avenue bridge.

The drainage along this route presents no unusual problems. The two Parkway low points are to be drained into the Richmond Creek and Willowbrook Park Lake.

Geology and Subsurface Conditions

The soil conditions along the route of Alternate 4 vary considerably.

Organic silts in the swampland at the southern terminus of the route will have to be removed. Some 390,000 cubic yards of this unsuitable material will have to be

excavated and then backfilled with approximately 410,000 cubic yards of select granular material.

In addition, between Station 284 and Station 296, approximately 190,000 cubic yards of sanitary land fill will require removal. Depths of land fill up to thirty-five feet are expected to be encountered in this area.

The area between the sanitary land fill and Willowbrook Park consists of soil which is generally good. A foot of topsoil is underlain by sand and silt with a trace of gravel. Since the Parkway is to be depressed through part of this area, the more silty textured soils may create a seepage problem similar to that described under Alternate 3. (See page 37)

The muck deposits located throughout Willowbrook Park and the Willowbrook Expressway-Staten Island Expressway Interchange have to be removed in the areas where pavement is to be constructed. It is expected that unsuitable material will be encountered under the north service road in the northeast quadrant of the interchange, in the vicinity of the south service road in the southwest quadrant, and in the areas adjacent to the Parkway at Station R410. It is estimated that 35,000 cubic yards of unsuitable material will have to be removed in these areas. A corresponding 40,000 cubic yards of granular backfill will be required.

The subsurface conditions at the bridge sites and the probable foundation designs are as follows:

Relocated Richmond Creek

Forest Hill Road Extension

Richmond Hill Road — (Subsurface information awaits completion of borings.)

Rockland Avenue

Willowbrook Parkway

Victory Boulevard

Three-level viaduct

In the swamp area of the Willowbrook Park, a high ground water table exists. For this reason the Parkway profile from Station RS405 to Victory Boulevard has been placed on a minimum of four feet of fill.

Social and Economic Considerations

Approximately 55% of the route traversed by Alternate 4 will be across city-owned lands. The acquisition of private property will be required only in the sections from Forest Hill Road Extension to Willowbrook Park and the areas adjacent to the Staten Island Expressway interchange.

The remainder of the route passes through portions of Latourette Park and Willowbrook Park.

The acquisition of the following buildings will be required under Alternate 4:

3 houses
1 garage
1 barn
3 sheds
8 Buildings Total

Of the three homes acquired, one is not occupied at the present time. This route will therefore require the dislocation of two families.

Approximately half of the route passes through lands which are zoned residential. The possibility therefore exists of future home construction along this route before final acquisition mapping can be completed.

Estimated costs for Alternate 4 are tabulated:

Right-of-way Acquisition	$ 3,000,000*
Construction	15,500,000
Engineering Services (7% Construction)	1,100,000
Subtotal	$19,600,000
Lost Investment	2,550,000
Total	$22,150,000

A detailed breakdown of the properties that would be affected by acquisition is given in Table

Construction cost is detailed in Table 2.

Lost investments will include $1,000,000 for the preparation of plans for the original route, $1,500,000 for the abandonment of the three-level interchange and $50,000 for the abandonment of portions of the Willowbrook Expressway-Staten Island Expressway Interchange.

A road-user benefit ratio of 2.6 is obtained for this alternate.

*Acquisition cost based on equalization factor of 2.0 for purposes of this preliminary draft.

Alternate 4

TABLE 2

Clearing and Grubbing	$ 70,000
Earthwork	3,500,000
Drainage	2,300,000
Structures	3,800,000
Pavement	2,200,000
Shoulders	350,000
Curb	260,000
Maintenance of Traffic	250,000
Guide Rail	150,000
Fence	200,000
Lighting	1,150,000
Water Mains	150,000
Police Telephone	110,000
Miscellaneous Utilities	70,000
Signs	250,000
Landscaping	180,000
Miscellaneous	510,000
Total Construction Cost	$15,500,000*

*Includes the cost of constructing the Willowbrook Parkway Interchange bridges.

Other Considerations

The possibility of fitting the roadway to the landscape is limited on Alternate 4. The Parkway has been depressed for aesthetic reasons through most of the residential area; however, from Station R361 to Willowbrook Park, the Parkway has been placed on fill.

Since the Parkway is in cut through most of the residential area, the proposed municipal drainage plan in this area will require modification.

Existing water lines along Richmond Hill Road, Rockland Avenue, Victory Boulevard and the north and south service roads of the Staten Island Expressway will have to be adjusted or relocated under this alternate.

DESCRIPTION OF ALTERNATE 5

General

The southerly end of Alternate 5 will depart from the original Parkway alignment at the beginning of Section 1. It will swing in a northwesterly direction toward Richmond Avenue, cross the marshlands and pass through the sanitary land fill for a distance of 1,400 feet.

The work required in this area will be similar to the construction under Alternates 3 and 4. This will include the construction of the two Richmond Avenue ramps, the relocation of the Richmond Creek and the construction of a bridge over the relocated creek.

The Parkway will rise on fill, pass over Richmond Avenue and continue northward along the City-owned lands on the west side of Richmond Avenue. The roadway will remain on fill as it follows a route generally parallel to Richmond Avenue.

In this area Richmond Avenue is to be converted into a divided highway with the Parkway lying between the two roadways. These roadways will function as service roads for the Parkway. The existing Richmond Avenue is to be used as the northbound service road from Station R300 to Station R377. The creek which is presently located approximately four hundred feet to the west of Richmond Avenue is to be relocated between the Parkway and the southbound service road.

As the Parkway approaches Richmond Hill Road, it will pass on the west side of a large bowling alley and retail outlet situated in the southwest corner of the Richmond

Avenue-Richmond Hill Road intersection. It will cross over the extension of Richmond Hill Road and proceed across the swamplands of Springville Creek.

At Richmond Hill Road a diamond-type interchange is provided to service the area.

After crossing the swamp, the Parkway will pass through the easterly edge of the William T. Davis Wildlife Refuge. The southbound service road will pass immediately adjacent to the Department of Parks' maintenance buildings in this area.

The Parkway will follow a route through the woodlands of the wildlife preserve and will continue across Richmond Avenue and Rockland Avenue. The right-of-way which has been acquired by the City in this area for the Richmond Avenue widening is to be utilized for the northbound service road. The existing Richmond Avenue from Travis Avenue to a point 700 feet to the north is to be used for the southbound service road.

After crossing Rockland Avenue the Parkway will travel in a northeasterly direction, curving across the southeast corner of the Willowbrook Park to join with the proposed Willowbrook Parkway.

A direct connection interchange between the two parkways is to be constructed. This interchange will consist of six bridges, all of which may be constructed under the Willowbrook Parkway construction program.

The two parkways converge and continue as four-lane roadways for a distance of 1,500 feet along the easterly perimeter of the Willowbrook Park. The interchange

complex of Alternate 5 with Victory Boulevard and the Staten Island Expressway will be identical to the interchange treatment presented for Alternate 4. (See page).

Land Use

On the whole, Alternate 5 is so located as to make the maximum use of the available publicly owned lands on the west side of the study area. However, the route will pass through two sections which merit discussion in this report.

The routing of the Parkway through the New York City owned lands on the west side of Richmond Avenue is an excellent example of good use of marginal lands in an urban area for highway purposes. The City owns over 350 acres of land in this area and the 50 acres required for the Parkway right-of-way are readily available.

Ultimately the remainder of this tract of land will be developed into the cultural and civic center. The Parkway will then serve as an effective divider between this land and the commercial area on the east side of Richmond Avenue.

The Parkway alignment in the vicinity of the proposed Willowbrook Parkway will be identical to that of Alternate 4. As mentioned previously, the Parkway in this area acts as a divider between the Willowbrook Park and the Willowbrook State School.

Traffic

The traffic volumes and distributions of Alternate 5 will be essentially the

same as those of Alternate 4. Figure indicates the traffic flow diagram for Alternate 5. The 1986 AADT is 64,700. The 1986 DHV of 4205 requires the ultimate construction of three lanes in each direction.

As in the case of Alternate 4, the relocation of this route 2.5 miles to the west of the originally planned Richmond Parkway will divert a considerable amount of traffic from it. This diversion will also affect the Willowbrook Parkway in this area, allowing it to be constructed with only two lanes in each direction.

The traffic discussion pertaining to the effect of Alternate 4 on the Staten Island Arterial Highway System and on traffic operations in the Willowbrook Expressway-Staten Island Expressway interchange relates equally to Alternate 5. (See pages 44-49). In summary, Alternate 5 will tend to alter the Arterial Highway spacing and travel desire lines to an even greater extent than Alternate 4 and, as in that case, will concentrate the traffic loads of four major arteries into one interchanging area.

The length of the approach merging section on Alternate 5 will be 1,500 feet. This is the minimum distance deemed necessary for traffic on the Willowbrook Parkway desiring to exit at Victory Boulevard to weave with Richmond Parkway traffic and then move over two lanes in order to exit.

The Alternate 4 discussion pertaining to the Richmond Avenue and Willowbrook Parkway interchanges is also relevant to Alternate 5. (See pages 49-50). However, the interchange of Richmond Hill Road with Alternate 5 is not expected to provide

as efficient a traffic circulation pattern as that of Alternate 4. The latter will pass on the periphery of the commercial area and its service roads will accommodate primarily Parkway traffic, while Alternate 5 will pass through the heart of the commercial and civic center.

Richmond Avenue will be required to serve a dual function in this area. It must not only handle the parkway service road traffic, but also serve as the major local street servicing the "Heartland." Considerably more operational friction is anticipated between the service roads and Parkway compared with Alternate 4.

Under Alternate 5 Forest Hill Road will have to be remapped in order that it will intersect with Richmond Avenue on the east side of the parkway at Station R302.

Right-of-way for future service roads will have to be acquired in order to ensure maintenance of the traffic circulation pattern of the mapped street system between Richmond Avenue (north) and Willowbrook Park.

Alternate 5 will provide convenient access to Richmondtown. Southbound Richmond Parkway traffic will exit at Richmond Hill Road and proceed 1.6 miles to the west or follow Willowbrook Parkway to Forest Hill Road and then continue 1.5 miles along Forest Hill Road and Richmond Hill Road to Richmondtown. Northbound Richmond Parkway traffic will either exit at Richmond Hill Road and continue westerly for 1.6 miles or exit at Arthur Kill Road and follow this roadway 2.0 miles to Richmondtown.

Topography and Physical Features

The alignment of Alternate 5 as presented in the preliminary report followed along the west side of Richmond Avenue south of the commercial area and connected into the originally planned route of the Richmond Parkway south of Arthur Kill Road. This alignment required modification to both Section 1 and Section 2.

With the construction of Section 2 presently under way, this investigation of a route for Alternate 5 has been based on the Parkway being constructed as originally proposed to Station 261.

Thus the route of Alternate 5 presented will cross Arthur Kill Road and Richmond Avenue as part of the Section 2 construction, and then will re-cross Richmond Avenue twice within the northern section. As a result, the alignment of Alternate 5 will be somewhat circuitous, being over 1,200 feet longer than Alternate 4.

The minimum radius to be used on Alternate 5 will be 1,910 feet, there being three such curves along the route. Two of the curves will be at the southerly end where, between Station 261 and Station 310, the Parkway swings from the east side of Richmond Avenue to the west side. The other such curve will be in the Willow- Parkway interchange.

The grades encountered along the route are good. No grade will exceed the desirable maximum gradient of three percent. The steepest grade that will be used is the 2.70 percent over the Richmond Avenue (north) bridge.

The drainage along this alternate will be readily accommodated by the creeks adjacent to the Parkway, the Willowbrook Park Lake and the drainage swales crossed by the Parkway.

Geology and Subsurface Conditions

The soil conditions along the route of Alternate 5 vary considerably.

In the southern section where this alternate will cross the Richmond Creek swamp, approximately 370,000 cubic yards of the unsuitable organic silts and meadow mat will have to be excavated and removed. An additional 390,000 cubic yards of select granular backfill material will be required in this area.

In addition, between Station R278 and Station R292, approximately 120,000 cubic yards of land fill with depths up to 25 feet will have to be removed.

The land on the west side of Richmond Avenue opposite the proposed commercial area .....

(Subsurface Information Awaits Completion of Borings.)

From Station R341 to Station R357 the southbound service road and a portion of the southbound Parkway pavement will pass through sanitary land fill. Excavation of 65,000 cubic yards of fill ranging in depths to thirty feet will be required in this area. As estimated, 140,000 cubic yards of unsuitable material in the Springville Creek swamp will also require removal. Approximately 150,000 cubic yards of select granular material are estimated as the backfill required.

The soil conditions between Springville Creek and the Willowbrook Park are good, generally consisting of sand and silt with a trace of gravel.

The muck deposits in the Willowbrook Park and the Willowbrook Expressway-Staten Island Expressway interchange which were mentioned under Alternate 4 (see page 51 or 52), also must be removed under this alternate route. This will require the excavation of 35,000 cubic yards of unsuitable material and the use of 40,000 cubic yards of granular backfill.

The subsurface conditions at the bridge sites and the probable foundation designs are as follows:

Relocated Richmond Creek

Richmond Avenue (South)

Richmond Hill Road Extension (Subsurface Information Awaits

Richmond Avenue (North) Completion of Borings.)

Rockland Avenue

Willowbrook Parkway

Victory Boulevard

Three-level Viaduct

In the swamp area of the Willowbrook Park, a high ground water table exists. For this reason the Parkway profile from Station RS405 to Victory Boulevard has been placed on a minimum of four feet of fill.

Social and Economic Considerations

Approximately 85 percent of the route traversed by Alternate 5 will be across city-owned lands. The acquisition of private property will be required only in the

sections from the Davis Wildlife Refuge to Willowbrook Park and the areas adjacent to the Staten Island Expressway interchange.

The remainder of the route will pass through Latourette Park, the William T. Davis Wildlife Refuge, Willowbrook Park and the City-owned lands on the west side of Richmond Avenue.

The acquisition of the following buildings will be required under Alternate 5.

10 houses
1 greenhouse
1 farm stand
2 barns
4 sheds
18 Buildings Total

Of the ten homes to be acquired, three are not occupied at the present time. This route will therefore require the dislocation of seven families. The farm stand to be acquired employs only one person.

Estimated costs for Alternate 5 are tabulated:

Right-of-way Acquisition	$ 1,600,000*
Construction	18,500,000
Engineering Services (7% Construction)	1,300,000
Subtotal	$21,400,000
Lost Investment	2,550,000
Total	$23,950,000

*Acquisition cost based on equalization factor of 2.0 for the purposes of this preliminary draft.

A detailed breakdown of the properties that would be affected by acquisition is given in Table .

Construction cost is detailed in Table 3.

Lost Investments will include $1,000,000 for the preparation of plans for the original route, $1,500,000 for the abandonment of the three-level interchange and $50,000 for the abandonment of portions of the Willowbrook Expressway - Staten Island Expressway Interchange.

A road-user benefit ratio of 2.5 is obtained for this alternate.

Alternate 5 will pass through very little undeveloped residential land, and the possibility of extensive construction along this route before acquisition mapping can be completed is minimal.

Other Considerations

Because of its proximity to tidal waters and low lying land, Alternate 5 has been placed on fill throughout its entire length. It is therefore considered the least desirable of the three routes studied from the standpoint of aesthetics.

The future drainage plan of the area will require only minor modification under this alternate.

Existing water lines along Richmond Avenue, Rockland Avenue, Victory Boulevard, and the north and south service roads of the Staten Island Expressway will have to be adjusted or relocated under this alternate.

TABLE 3

Alternate 5

The construction costs for Alternate 5 are as follows:

Clearing and Grubbing	$ 60,000
Earthwork	5,700,000
Drainage	2,500,000
Structures	3,900,000
Pavement	2,500,000
Shoulders	360,000
Curb	320,000
Maintenance of Traffic	300,000
Guide Rail	180,000
Fence	210,000
Lighting	1,200,000
Water Mains	190,000
Police Telephone	110,000
Miscellaneous Utilities	70,000
Signs	250,000
Landscaping	180,000
Miscellaneous	470,000
Total Construction Cost	$18,500,000*

*Includes the cost of constructing the Willowbrook Parkway interchange bridges.

SUMMARY FOR COMPARISON PURPOSES

Purpose:

The purpose of this summary is to recapitulate the data discussed in the three sections describing Alternates 3, 4 and 5, and to present them in a convenient form for comparison. The summary consists of two parts: one containing a listing of advantages and disadvantages of the three alternates studied; the other, consisting of a table that summarizes the cost and acquisition data of each alternate.

Advantages and Disadvantages

It is convenient that a listing of advantages and disadvantages of the alternate routes distinguish those which are considered to be of major and minor significance.

In the comparison of the alternates, it is essential that each item be carefully considered and as far as possible weighted, in order that the final selection of an alternate will reflect the overall interests of the community.

The recapitulation of advantages and disadvantages is given in the following table.

ALTERNATE 3

Advantages (Major)

1. It avoids the most desirable portians of the "Greenbelt."
2. As it follows the same general route as the original Parkway, traffic patterns are essentially unchanged and the overall effect on the Staten Island Arterial System is negligible.
3. It utilizes the existing three-level bridge at the Staten Island Expressway.

Advantages (Minor)

1. It has highest benefit ratio of the three routes studied, and therefore provides the most value to the people.
2. It provides for an efficient traffic circulation pattern for the "Heartland," while maintaining direct access to the Latourette Park without costly improvement to local streets.
3. It has the best subsurface conditions of the three routes studied.

Disadvantages (Major)

1. It severs the Henry Kaufmann property.
2. It severs the Sea View Hospital complex.
3. There is a considerable amount of residentially zoned lands along the route and home building is imminent. These present a potentially serious acquisition problem prior to completion of mapping.

Disadvantages (Minor)

1. It has steepest grades of any alternate studied.

TABLE OF ADVANTAGES AND DISADVANTAGES OF ALTERNATE ROUTES

ALTERNATE 4

Advantages (Major)

1. It avoids the "Greenbelt" entirely.

Advantages (Minor)

1. It provides for an efficient traffic circulation pattern for the "Heartland."
2. It is the least expensive of the alternates studied.
3. It provides the most direct route from Richmond Avenue to the Staten Island Expressway.
4. It has relatively flat grades.

Disadvantages (Major)

1. It significantly alters the highway spacing of the Staten Island Arterial Highway system and places additional traffic loads on the local street systems and other portions of the Arterial Highway network.
2. It concentrates the traffic loads of four major arteries into one interchange area, creating potentially serious operational problems.
3. It abandons the existing three-level bridge at the Staten Island Expressway.
4. It requires major modification to the existing Willowbrook Expressway-Staten Island Expressway interchange.
5. The route of this alternate divides the proposed residential area.

Disadvantages (Minor)

ALTERNATE 5

Advantages (Major)

1. It avoids the "Greenbelt" entirely.
2. It utilizes marginal land already owned by the City.

Advantages (Minor)

1. It has relatively flat grades.
2. It services the "Heartland" area.

Disadvantages (Major)

1. It significantly alters the highway spacing of the Staten Island Arterial Highway system and places additional traffic loads on the local street systems and other portions of the Arterial Highway network.
2. It concentrates the traffic loads of four major arteries into one interchange area, creating potentially serious operational problems.
3. It abandons the existing three-level bridge at the Staten Island Expressway.
4. It requires major modification to the existing Willowbrook Expressway-Staten Island Expressway interchange.

Disadvantages (Minor)

1. The route is circuitous.
2. It has the lowest benefit ratio of the three routes studied and, therefore, provides the least value to the people.
3. It has the poorest subsurface conditions of the three routes studied.
4. It is the most expensive route studied.

Tabulation of Costs and Acquisitions

	Alternate 3	Alternate 4	Alternate 5
Right-of-way Acquisition Cost	$ 3,000,000	$ 3,000,000	$ 1,600,000
Construction Cost	18,200,000	15,500,000	18,500,000
Engineering Cost (7% Construction Cost)	1,300,000	1,100,000	1,300,000
Subtotal	$22,500,000	$19,600,000	$21,400,000
Cost of Lost Investments*			
Engineering Cost for Original Route	1,000,000	1,000,000	1,000,000
Original Three-level Interchange Richmond Parkway and Staten Island Expressway	0	1,500,000	1,500,000
Modification to Willowbrook Expressway-Staten Island Expressway Interchange	0	50,000	50,000
Total Cost	$23,500,000	$22,150,000	$23,950,000

*The right-of-way costs for the original route are not considered as lost investments in this analysis. These lands, most of which are presently in use in Latourette Park, are extremely valuable assets to the park system.

Road-user Benefit Ratio	3.5	2.6	2.5
Total Length	4.6Mi	3.9Mi	4.2Mi
Total Number of Buildings Acquired	22	8	18
Number of Houses Acquired	9	3	10
Number of Families Dislocated	7	2	7
Number of Businesses Acquired	0	0	1
Number of Employees in Businesses Affected	0	0	1

Concluding Comments

The change and growth brought about by the construction of the Narrows Bridge has required that open space be set aside to answer the growing aesthetic and recreational needs of Staten Island. No greater opportunity exists to protect such unspoiled areas than in the green escarpment which forms the central backbone of Staten Island.

The beauty and wild character of the Staten Island "Greenbelt" should be preserved as a bulwark against today's urbanization and for the enjoyment of generations to come. The selection of an alternate route must be based on careful consideration of the data presented in this report.

Each of the three alternate routes selected as worthy of consideration in depth has its advantages and disadvantages. In an urban area where the possibilities of alternate routes are limited, this is not unusual. Indeed, it is the rare urban arterial that is built which does not affect some segment of the population adversely.

As a result of our investigations and the information presented in this report, it is our opinion that of the alternates studied, Alternate 3 provides the highest level of traffic service to the community while at the same time creating a minimum of damage to the existing culture.

ADDENDUM TO RICHMOND PARKWAY

LOCATION REPORT - July 20, 1966

Preliminary Comments Relating to the Engineering

Aspects of the Originally Proposed Route

LOCKWOOD, KESSLER & BARTLETT, INC.

ORIGINAL RICHMOND PARKWAY, SECTION 1

Land Use - Excellent - The original route travels along the westerly perimeter of Latourette Park and continues northward following along the edges of the Pouch Boy Scout Camp, the Kaufmann Camp, the Richmond County Country Club and the St. Frances Seminary.

Traffic - Excellent - The original route forms an integral part of the Staten Island Arterial Highway System; it provides an equal spacing of north-south arterial highways and assures a sound, well-planned traffic distribution system for the people of the Island.

It provides excellent access to the Richmondtown Restoration.

All the alternate routes studied provide more convenient access to the "Heartland" than the original route. The original parkway interchange with Richmond Hill Road is 1.0 miles to the east of the proposed commercial area.

Topography and Physical Features

The original route traverses rugged terrain along the central ridge of Staten Island. Over 30 percent of the route has grades in excess of 4.5 percent. The maximum gradient along the alternate routes studied is 4.0 percent.

The horizontal alignment of the original route is curvilinear and satisfactory for a parkway.

Geology and Subsurface Conditions

The subsurface conditions along the original parkway are basically the same as those along Alternate 3.

Social and Economic Considerations

The right-of-way for the original route has already been acquired. There are therefore no problems relating to dislocation of families.

The costs of the original parkway are:

Right-of-way Acquisition	$ 2,880,000
Low Bid on Construction Contract	14,200,000*
Engineering Services	1,000,000
Total	$18,080,000

*Engineer's Estimate was $16,000,000.

Other Considerations

Original parkway was designed as a scenic route with overlooks provided at Orhbach Lake and the ridge overlooking the Richmond County Country Club.